



**Northbound New York Central steam locomotive no. 5439
as it leaves Dayton, Ohio.**

**This is a historical / biographical work
based on the public domain book
“Illustrated Catalogue of Locomotives; Baldwin Locomotive Works”
by Matthew Baird
with edits, notes and arrangement by Larry W Jones**

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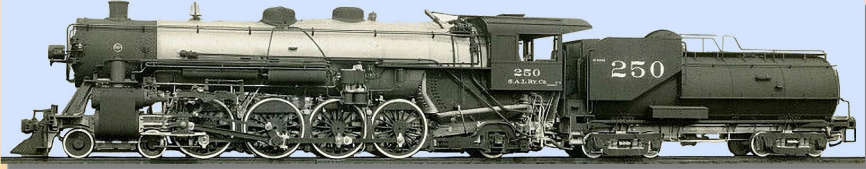
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Baldwin - King Of Locomotives



THE BALDWIN LOCOMOTIVE WORKS dates its origin from the inception of steam railroads in America. Called into existence by the early requirements of the railroad interests of the country, it has grown with their growth and kept pace with their progress. It has reflected in its career the successive stages of American railroad practice, and has itself contributed largely to the development of the locomotive as it exists to-day. A history of the Baldwin Locomotive Works, therefore, is, in a great measure, a record of the progress of locomotive engineering in this country, and as such cannot fail to be of interest to all who are concerned in this important element of our material progress.

(Note) *“as it exists to-day” was in 1872.*

MATTHIAS W. BALDWIN, the founder of the establishment, learned the trade of a jeweler, and entered the service of Thomas Fletcher & Sidney Gardiner, Jewelers and Silversmiths, Philadelphia, in 1817.

(Note) *Thomas Fletcher, in partnership with Sidney Gardiner and by himself after 1827, ran the most important silversmithery of the young republic, receiving commissions to make the most significant presentation silver of the day. The Maxwell Vase 1829. Presented to NY City District Attorney Hugh Maxwell by merchants grateful for his prosecution of corrupt directors of the New York Stock Exchange. In secret, Gardiner told Fletcher: "None of the silversmiths here know that I have the order, as several of them would drop the hammer if they knew. Fletcher responded with one of the largest and most spectacular statements of the Classical Revival style in American silver.*





Two years later he opened a small shop, in the same line of business, on his own account. The demand for articles of this character falling off, however, he formed a partnership, in 1825, with David Mason, a machinist, in the manufacture of bookbinders' tools and cylinders for calico-printing.

(Note) Calico fabric originated from the city of Calicut in India. It is a heavy, plain-woven textile made from unbleached, and often not fully processed, cotton. The fabric is far coarser than muslin, but less coarse and thick than canvas or denim.

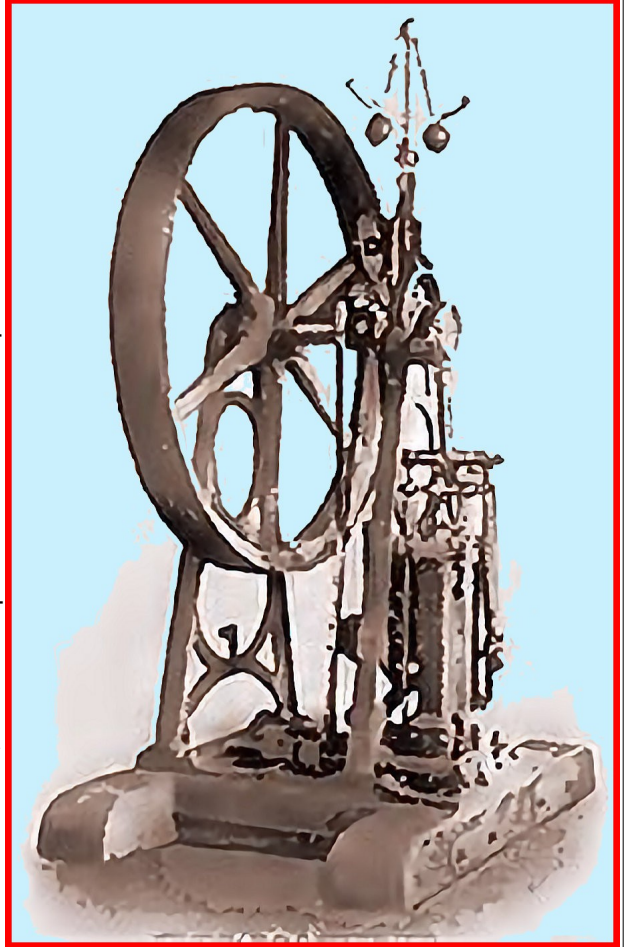
Their shop was in a small alley which runs north from Walnut Street, above Fourth. They afterwards removed to Minor Street, below Sixth. The business was so successful that

steam-power became necessary in carrying on their manufactures, and an engine was bought for the purpose. Proving unsatisfactory, Mr. Baldwin decided to design and construct one which should be specially adapted to the requirements of his shop. One requirement was that it should occupy the least possible space, and this was met by the construction of an upright engine on a novel and ingenious plan. On a bed-plate about five feet square an upright cylinder was placed; the piston-rod connected to a cross-bar having two legs, turned downward, and sliding in grooves on the sides of the cylinder, which thus formed the guides. To the sides of these legs, at their lower ends, was connected by pivots an inverted U-shaped frame, prolonged at the arch into a single rod, which took hold of the crank of a fly-wheel carried by upright standards on the bed-plate. It will be seen that the length of the ordinary separate guide-bars was thus saved, and the whole engine was brought within the smallest possible compass. The design of the machine was not only unique, but its workmanship was so excellent, and its efficiency so great, as readily to procure for Mr. Baldwin orders for additional stationary engines. His attention was thus turned to steam engineering, and the way was prepared for his grappling with the problem of the locomotive when the time should arrive.

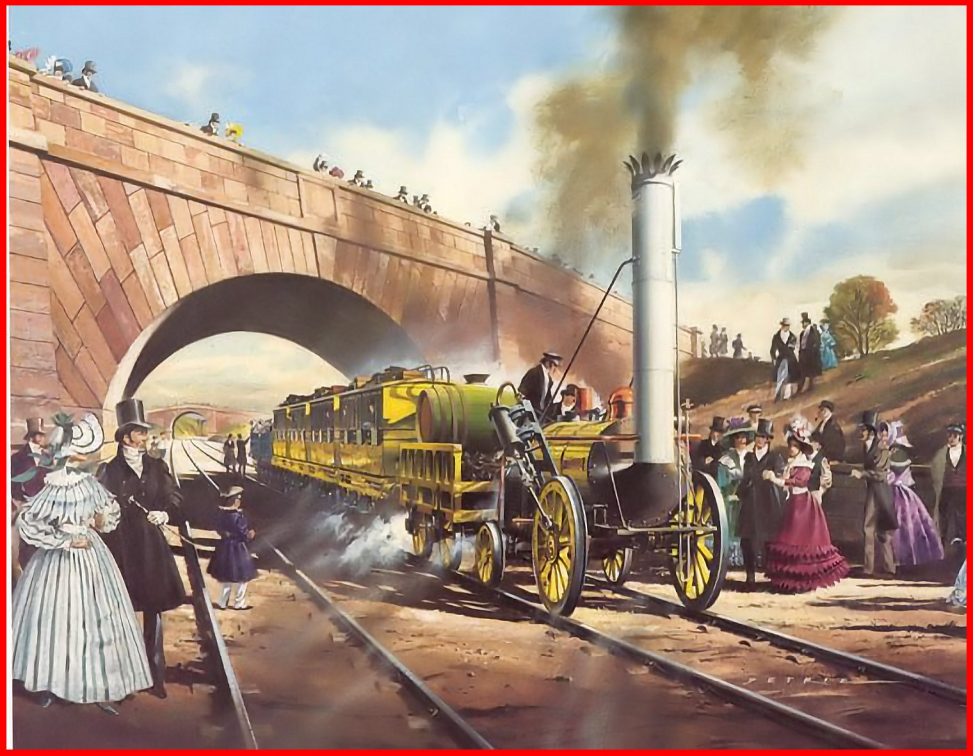
This original stationary engine, constructed prior to 1830, has been in almost constant service since its completion, and at this day (1872) is still in use, furnishing all the power required to drive the machinery in the erecting-shop of the present works.

The visitor who beholds it quietly performing its regular duty in a corner of the shop, may justly regard it with considerable interest, as in all probability the indirect foundation of the Baldwin Locomotive Works, and permitted still to contribute to the operation of the mammoth industry which it was instrumental in building up.

The manufacture of stationary steam-engines thus took a prominent place in the establishment, and Mr. Mason shortly afterward withdrew from the business.



In 1829-30 the use of steam as a motive power on railroads had begun to engage the attention of American engineers. A few locomotives had been imported from England, and one (which, however, was not successful) had been constructed at the West Point Foundry, in New York City. To gratify the public interest in the new motor, Mr. Franklin Peale, then proprietor of the Philadelphia Museum, applied to Mr. Baldwin to construct a miniature locomotive for exhibition in his establishment. With the aid only of the imperfect published descriptions and sketches of the locomotives which had taken part in the Rainhill competition in England, Mr. Baldwin undertook the work, and on the 25th of April, 1831, the miniature locomotive was put in motion on a circular track made of pine boards covered with hoop iron, in the rooms of the Museum. Two small cars, containing seats for four passengers, were attached to it, and the novel spectacle attracted crowds of admiring spectators. Both anthracite and pine-knot coal were used as fuel, and the exhaust steam was discharged into the chimney, thus utilizing it to increase the draught.



(Note) *The Rainhill trials was an important competition run from the 6 to 14 October 1829, to test George Stephenson's argument that locomotives would have the best motive power for the then nearly-completed Liverpool and Manchester Railway (L&MR). Ten locomotives were entered, of which five were able to compete, running along a 1 mile (1.6 km) length of level track at Rainhill, in Lancashire (now Merseyside). Stephenson's "Rocket" was the only locomotive to complete the trials, and was declared the winner. The directors of the L&MR accepted that locomotives should operate services on their new line, and George and Robert Stephenson were given the contract to produce locomotives for the railway.*

The success of the model was such that, in the same year, Mr. Baldwin received an order for a locomotive from the Philadelphia, Germantown and Norristown Railroad Company, whose short line of six miles to Germantown was operated by horse-power. The Camden and Amboy Railroad Company had shortly before imported a locomotive from England, which was stored in a shed at Bordentown. It had not yet been put together; but Mr. Baldwin, in company with his friend, Mr. Peale, visited the spot, inspected the detached parts, and made a few memoranda of some of its principal dimensions.

Guided by these figures and his experience with the Peale model, Mr. Baldwin commenced the task. The difficulties to be overcome in filling the order can hardly be appreciated at this day. There were few mechanics competent to do any part of the work on a locomotive. Suitable tools were with difficulty obtainable. Cylinders were bored by a chisel fixed in a block of wood and turned by hand. Blacksmiths able to weld a bar of iron exceeding one and one-quarter inches in thickness, were few, or not to be had. It was necessary for Mr. Baldwin to do much of the work with his own hands, to educate the workmen who assisted him, and to improvise tools for the various processes.

The work was prosecuted, nevertheless, under all these difficulties, and the locomotive was finally completed, christened the "Old Ironsides," and tried on the road, November 23, 1832. The circumstances of the trial are fully preserved, and are given, further on, in the extracts from the journals of the day. Despite some imperfections, naturally occurring in a first effort, and which were afterward, to a great extent, remedied, the engine was, for that early day, a marked and gratifying success. It was put at once into service, as appears from the Company's advertisement three days after the trial, and did duty on the Germantown road and others for over a score of years.



"OLD IRONSIDES," 1832

The "Ironsides" was a four-wheeled engine, modeled essentially on the English practice of that day, as shown in the "Planet" class, and weighed, in running order, something over five tons. The rear or driving-wheels were fifty-four inches in diameter. The front wheels, which were simply carrying wheels, were forty-five inches in diameter. The cylinders were nine and one-half inches in diameter by eighteen inches stroke, and were attached horizontally to the outside of the smoke-box. The wheels were made with heavy cast-iron hubs, wooden spokes and rims, and wrought-iron tires. The boiler was thirty inches in diameter, and contained seventy-two copper flues, one and one-half inches in diameter and seven feet long. The tender was a four-wheeled platform, with wooden sides and back, carrying an iron box for a water-tank. A peculiarity in the exhaust of the "Ironsides" was that there was only a single straight pipe running across from one cylinder to the other, with an opening in the upper side of the pipe, midway between the cylinders, to which was attached at right angles the perpendicular pipe into the chimney. The cylinders, therefore, exhausted against each other; and it was found, after the engine had been put in use, that this was a serious objection. This defect was afterwards remedied by turning each exhaust-pipe upward into the chimney. The steam-joints were made with canvas and red-lead, as was the practice in English locomotives, and in consequence much trouble was caused, from time to time, by leaking.

The price of the engine was to have been \$4000, but some difficulty was found in procuring a settlement. The Company claimed that the engine did not perform according to contract; and objection was also made to some of the defects alluded to. After these had been corrected as far as possible, however, Mr. Baldwin finally succeeded in effecting a compromise settlement, and received from the Company \$3500 for the machine.

We are indebted to Mr. H. R. Campbell, who was the Chief Engineer of the Germantown and Norristown Railroad when the "Ironsides" was placed in service, and who is thoroughly familiar with all the facts in regard to the engine. Much of the success of the machine was due to his exertions, as, while the President of the Company was inclined to reject it as defective, Mr. Campbell was earnest in his efforts to correct its imperfections, and his influence contributed largely to retain the engine on the road.

The *United States Gazette* of Nov. 24th, 1832, remarks: "A most gratifying experiment was made yesterday afternoon on the Philadelphia, Germantown and Norristown Railroad. The beautiful locomotive engine and tender, built by Mr. Baldwin, of this city, whose reputation as an ingenious machinist is well known, were for the first time placed on the road. The engine traveled about six miles, working with perfect accuracy and ease in all its parts, and with great velocity."

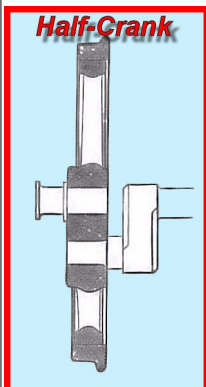
On subsequent trials, the "Ironsides" attained a speed of thirty miles per hour, with its usual train attached. So great were the wonder and curiosity which attached to such a prodigy, that people flocked to see the marvel, and eagerly bought the privilege of riding after the strange monster. The officers of the road were not slow to avail themselves of the public interest to increase their passenger receipts, and the following advertisement from *Poulson's American Daily Advertiser* of Nov. 26, 1832, will show that as yet they regarded the new machine rather as a curiosity and a bait to allure travel than as a practical, every-day servant:

"NOTICE.—The locomotive engine (built by M. W. Baldwin, of this city) will depart daily, *when the weather is fair*, with a train of passenger cars. *On rainy days horses will be attached.*" This announcement did not mean that in wet weather horses *would be attached to the locomotive* to aid in drawing the train, but that the usual horse-cars would be employed in making the trips upon the road without the engine.

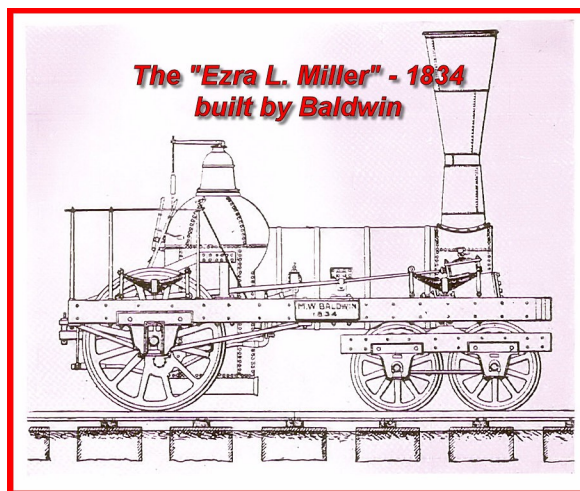
Upon making the first trip to Germantown with a passenger train with the Ironsides, one of the drivers slipped upon the axle, causing the wheels to track less than the gauge of the road and drop in between the rails. It was also discovered that the valve arrangement of the pumps was defective, and they failed to supply the boiler with water. They were corrected in a few days, and the machine was used in experimenting upon its efficiency, making occasional trips with trains to Germantown. The road had an ascending grade, nearly uniform, of thirty-two feet per mile, and for the last half-mile of forty-five feet per mile, and it was found that the engine was too light for the business of the road upon these grades. Such was Mr. Baldwin's first locomotive; and it is related of him that his discouragement at the difficulties which he had undergone in building it and in finally procuring a settlement for it was such that he remarked to one of his friends, with much decision, "That is our last locomotive."

Shortly after the "Ironsides" had been placed on the Germantown road, Mr. E. L. Miller, of Charleston, S. C, came to Philadelphia and made a careful examination of the machine. Mr. Miller had, in 1830, contracted to furnish a locomotive to the Charleston and Hamburg Railroad Company, and accordingly the engine "Best Friend" had been built under his direction at the West Point Foundry, New York. After inspecting the "Ironsides," he suggested to Mr. Baldwin to visit the Mohawk and Hudson Railroad and examine an English locomotive which had been placed on that road in July, 1831, by Messrs. Robert Stephenson & Co., of Newcastle, England.

It was originally a four-wheeled engine of the "Planet" type, with horizontal cylinders and crank-axle. The front wheels of this engine were removed about a year after the machine was put at work, and a four-wheeled swiveling or "bogie" truck substituted.



The result of Mr. Baldwin's investigations was the adoption of this design, but with some important improvements. Among these was the "half-crank," which he devised on his return from this trip, and which he patented September 10, 1834. In this form of crank, the outer arm is omitted, and the wrist is fixed in a spoke of the wheel. In other words, the wheel itself formed one arm of the crank. The result sought and gained was that the cranks were strengthened, and, being at the extremities of the axle, the boiler could be made larger in diameter and placed lower. The driving axle could also be placed back of the fire-box, the connecting rods passing by the sides of the fire-box and taking hold inside of the wheels. This arrangement of the crank also involved the placing of the cylinders outside the smoke-box, as was done on the "Ironsides."



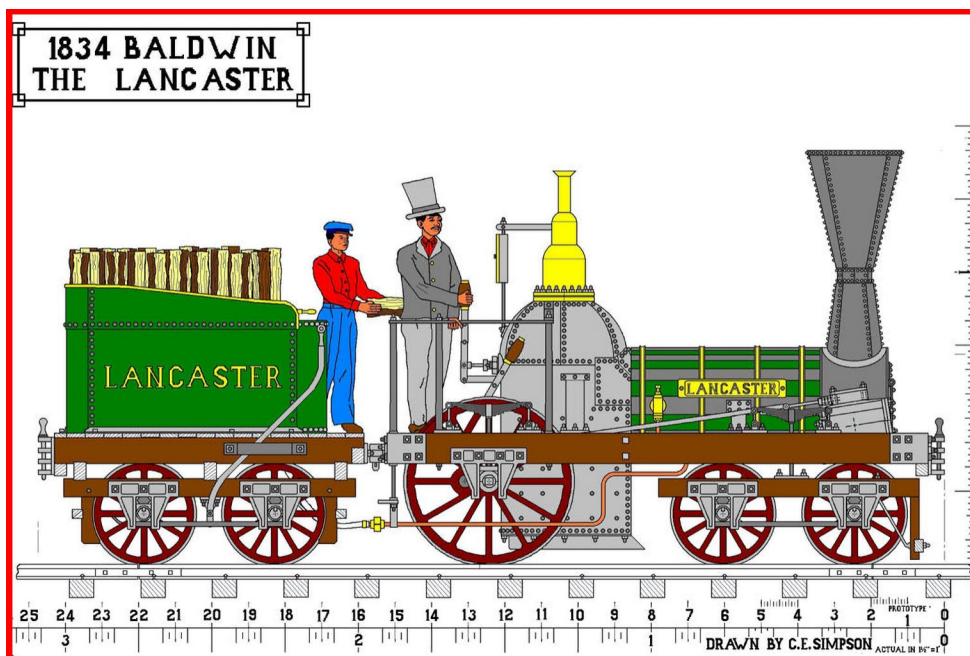
By the time the order for the second locomotive was received, Mr. Baldwin had matured this device and was prepared to embody it in practical form. The order came from Mr. Ezra L. Miller in behalf of the Charleston and Hamburg Railroad Company, and the engine bore his name, and was completed February 18, 1834. It was on six wheels; one pair being drivers, four and a half feet in diameter, with half-crank axle placed back of the fire-box as above described, and the

four front wheels combined in a swiveling truck. The driving-wheels, it should be observed, were cast in solid bell-metal. The combined wood and iron wheels used on the "Ironsides" had proved objectionable, and Mr. Baldwin, in his endeavors to find a satisfactory substitute, had recourse to brass. June 29, 1833, he took out a patent for a cast-brass wheel, his idea being that by varying the hardness of the metal the adhesion of the drivers on the rails could be increased or diminished at will. The brass wheels on the "Miller," however, soon wore out, and the experiment with this metal was not repeated.

The "E. L. Miller" had cylinders ten inches in diameter; stroke of piston, sixteen inches; and weighed, with water in the boiler, seven tons eight hundred-weight. The boiler had a high dome over the fire-box, and this form of construction, it may be noted, was followed, with a few exceptions, for many years.

The valve-motion was given by a single fixed eccentric for each cylinder. This form of single eccentric, peculiar to Mr. Baldwin, was in the interest of simplicity in the working parts, and was adhered to for some years. It gave rise to an animated controversy among mechanics as to whether, with its use, it was possible to get a lead on the valve in both directions. Many maintained that this was impracticable; but Mr. Baldwin demonstrated by actual experience that the reverse was the case.

Meanwhile the Commonwealth of Pennsylvania had given Mr. Baldwin an order for a locomotive for the State Road, as it was then called, from Philadelphia to Columbia, which, up to that time, had been worked by horses. This engine, called the "Lancaster," was completed in June, 1834. The success of the machine on its trial trips was such that the Legislature decided to adopt steam-power for working the road, and Mr. Baldwin received orders for several additional locomotives. Two others were accordingly delivered to the State in September and November respectively of that year, and one was also built and delivered to the Philadelphia and Trenton Railroad Company during the same season. This latter engine, which was put in service October 21, 1834, averaged twenty-one thousand miles per year to September 15, 1840.



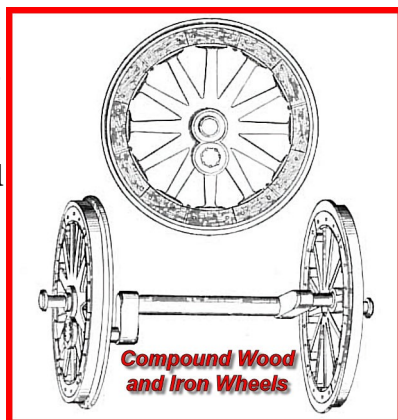
Five locomotives were thus completed in 1834, and the new business was fairly under way. The building in Lodge Alley, to which Mr. Baldwin had removed from Minor Street, and where these engines were constructed, began to be found too contracted, and another move was decided upon. A location on Broad and Hamilton Streets was selected, and a three-story L-shaped

brick building, fronting on both streets, erected. This was completed and the business removed to it during the following year (1835). The original building still stands, forming the office, drawing-room, and principal machine-shops of the present works. These early locomotives, built in 1834, were the types of Mr. Baldwin's practice for some years. All, or nearly all of them, embraced several important devices, which were the results of his study and experiments up to that time. The devices referred to were patented September 10, 1834, and the same patent covered the four following inventions, viz.:

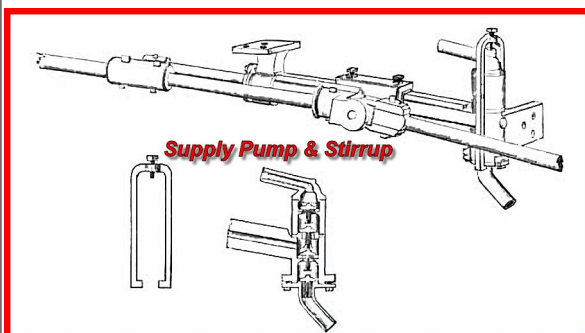
1. The half-crank, already described.

2. COMPOUND WOOD AND IRON WHEELS, 1834.

A new mode of constructing the wheels of locomotive engines and cars. In this the hub and spokes were of cast-iron, cast together. The spokes were cast without a rim, and terminated in segment flanges. By this means, the injurious effect of the unequal expansion of the materials was lessened or prevented. The flanges bore against wooden felloes, made in two thicknesses. Tenons or pins projected from the flanges into openings made in the wooden felloes, to keep them in place. Around the whole the tire was passed and secured by bolts.



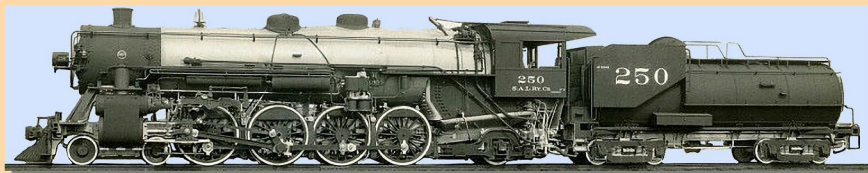
3. A new mode of forming the joints of steam and other tubes. This was a very valuable improvement over previous methods of making joints with red-lead packing, which made it possible to carry a much higher pressure of steam.



4. A new supply-pump, and of locating the pump itself. This invention consisted in making the single guide-bar hollow and using it for the pump-barrel. The pump-plunger was attached to the piston-rod at a socket or sleeve, and the hollow guide-bar terminated in the vertical pump-chamber. This chamber

was made in two pieces, joined about midway between the induction and eduction-pipes. This joint was ground steam-tight. All parts were held together by a stirrup with a set-screw in its arched top, and the arrangement was such that by simply unscrewing this set-screw the different sections of the chamber, with all the valves, could be taken apart for cleaning or adjusting.

Baldwin - King Of Locomotives



It is probable that the five engines built during 1834 embodied all, or nearly all, these devices. They all had the half-crank, the ground joints for steam-pipes (which was first made by him in 1833), and the pump formed in the guide-bar, and all had the four-wheeled truck in front, and a single pair of drivers back of the fire-box. On this position of the driving-wheels, Mr. Baldwin laid great stress, as it made a more even distribution of the weight, throwing about one-half on the drivers and one-half on the four-wheeled truck. It also extended the wheel-base, making the engine much steadier and less damaging to the track. Mr. William Norris, who had established a locomotive works in Philadelphia in 1832, was at this time building a six-wheeled engine with a truck in front and the driving-wheels placed in front of the fire-box.

Considerable rivalry existed between the two manufacturers as to the merits of their respective plans. In Mr. Norris's engine, the position of the driving-axle in front of the fire-box threw on it more of the weight of the engine, increasing the adhesion and the tractive power. Mr. Baldwin, however, maintained that his plan gave a better distribution of the weight and a longer wheel-base, and consequently rendering the machine less destructive to the track. Iron rails then in use were light and much of the track was of wood.



English builders were making locomotives with canvas and red-lead joints, permitting steam pressure of only sixty pounds per inch. Baldwin's machines worked at one hundred twenty pounds pressure. Several locomotives imported from England at this time had canvas and red-lead joints, and their efficiency was so much less than that of the Baldwin engines, on account of this and other features of construction, that they were soon laid aside or sold.

In June, 1834, a patent was issued to E. L. Miller for Baldwin's second engine, for increasing adhesion of a locomotive by throwing a part of the weight of the tender on the rear of the engine, thus increasing the weight on the drivers.

(Note) Patented June 19, 1834. Letter Patent. The schedule referred to in these Letters Patent and making part of the same containing a description in the words of the said Ezra L. Miller himself of his improvement in the mode of increasing the adhesion of the driving wheels of the Locomotive Steam Engine.

TO ALL TO WHOM THESE PRESENTS SHALL COME. Be it known that I Ezra L. Miller of the City and District of Charleston, State of South Carolina have invented a new and useful mode of increasing the adhesion of the driving wheels of the Locomotive Steam Engine on Rail Roads by using the tender or car next the Engine for purpose of adding weight to the driving wheels of the Engine at such time only as a greater adhesion is required than the weight would give which it would be practicable to carry as a fixed weight on those wheels, without injury to the road. At the points of starting and on the ascents where increased adhesion is required. I attach part of the weight of the Car or tender which is next the engine to the end of the frame of the Engine next the driving wheels which may be done by means of a lever, a screw, wedge or pulley, and detach it again when the increased adhesion is no longer necessary. The mode which I have used and found to answer perfectly in practice is simply to connect the car or tender next the Engine, to the Engine by a strong iron bar or lever one end of which is bolted to the under side of a cross timber in the frame of the car or tender. A little back of the center and which lever extends under the frame of the tender to the end of of the frame of the Engine and into the iron which together with the driving bolt secures it to the Engine. Traversely to this lever I attach to the end of the tender next the Engine two levers so that their fulcrums shall be six or eight inches on each side of the main lever or drawing bar. These levers have a jaw or pivot five or six inches in length directly over the main lever and shall be 4 1/2 feet in length. When the increased adhesion is wanted, the Engineer has only to place his foot upon the ends of the levers and press them in to a hook or groove for that purpose on the corner post of the tender and a portion of the weight of the car or tender next the engine is thus thrown upon the driving wheels of the engine and when the increased adhesion is no longer wanted his weight is detached by simply loosening the ends of the levers. What I claim as my invention is the making use of the car or tender next the Engine for the purpose of increasing the adhesion of the driving wheels of the Locomotive Steam Engine at these points when more adhesion is required than the weight would give which is eligible to carry as a fixed weight on these wheels whether the same be effected in the mode above described or any other which attains the same end. Ezra L. Miller, Exd. or Exa (Examined) N.Y.C. Witnessed, Walter Clark, Wm. Bayliss.

Mr. Baldwin adopted this device on an engine built for the Philadelphia and Trenton Railroad Company, May, 1835, and thereafter used it largely, paying one hundred dollars royalty for each engine. Eventually (May 6, 1839) he bought the patent for nine thousand dollars, evidently considering that the device was especially valuable, if not indispensable, in order to render his engine as powerful, when required, as other patterns having the driving-wheels in front of the fire-box, and therefore utilizing more of the weight of the engine for adhesion.

In making the truck and tender wheels of these early locomotives, the hubs were cast in three pieces and afterward banded with wrought-iron, the interstices being filled with spelter. This method of construction was adopted on account of the difficulty then found in casting a chilled wheel in one solid piece.

April 3, 1835, Mr. Baldwin took out a patent for certain improvements in the wheels and tubes of locomotive engines. That relating to the wheels provided for casting the hub and spokes together, and having the spokes terminate in segments of a rim, as described in his patent of September 10, 1834. Between the ends of the spokes and the tires wood was interposed, and the tire might be either of wrought-iron or of chilled cast-iron. The intention was expressed of making the tire usually of cast-iron chilled. The main object, however, was declared to be the interposition between the spokes and the rim of a layer of wood or other substance possessing some degree of elasticity. This method of making driving-wheels was followed for several years.

Early in 1835, the new shop on Broad Street was completed and occupied. Mr. Baldwin's attention was thenceforward given to locomotive building exclusively, except that a stationary engine was occasionally constructed. In May, 1835, his eleventh loco-

motive, the "Black Hawk," was delivered to the Philadelphia and Trenton Railroad Company. This was the first outside-connected engine of his build. It was also the first engine on which the Miller device of attaching part of the weight of the tender to the engine was employed. On the eighteenth engine,

the "Brandywine," built for the Philadelphia and Columbia Railroad Company, brass tires were used on the driving-wheels, for the purpose of obtaining more adhesion; but they wore out rapidly and were replaced with iron.



Fourteen engines were constructed in 1835; forty in 1836; forty in 1837; twenty-three in 1838; twenty-six in 1839; and nine in 1840. During all these years the general design continued the same; but, in compliance with the demand for more power, three sizes were furnished, as follows:

First-class.	Cylinders,	12½ × 16	weight,	loaded,	26,000 pounds.
Second-class.	"	12 × 16	"	"	23,000 "
Third-class.	"	10½ × 16	"	"	20,000 "

The first-class engine he fully believed, in 1838, was as heavy as would be called for, and he declared that it was as large as he intended to make. Most of the engines were built with the half-crank, but occasionally an outside-connected machine was turned out. These latter, however, failed to give as complete satisfaction as the half-crank machine. The drivers were generally four and a half feet in diameter.

A patent was issued to Mr. Baldwin, August 17, 1835, for his device of cylindrical pedestals. In this method of construction, the pedestal was of cast-iron, and was bored in a lathe so as to form two concave jaws. The boxes were also turned in a lathe so that their vertical ends were cylindrical, and they were thus fitted in the pedestals. This method of fitting up pedestals and boxes was cheap and effective, and was used for some years for the driving and tender wheels.

Mr. L. A. Sykes, engineer of the New Jersey Transportation Company, under date of June 12, 1838, wrote that he could draw with his engines twenty four-wheeled cars with twenty-six passengers each, at a speed of twenty to twenty-five miles per hour, over grades of twenty-six feet per mile. "As to simplicity of construction," he adds, "small liability to get out of order, economy of repairs, and ease to the road, I fully believe Mr. Baldwin's engines stand unrivaled. I consider the simplicity of the engine, the arrangement of the working-parts, and the distribution of the weight, far superior to any engine I have ever seen, either of American or English manufacture, and I have not the least hesitation in saying that Mr. Baldwin's engine will do the same amount of work with much less repairs, either to the engine or the track, than any other engine in use."

Some of Mr. Baldwin's engines on the State Road, in 1837, cost, for repairs, only from one and two-tenths to one and six-tenths cents per mile. It is noted that the engine "West Chester," on the same road, weighing twenty thousand seven hundred and thirty-five pounds (ten thousand four hundred and seventy-five on drivers), drew fifty-one cars (four-wheeled), weighing two hundred and eighty-nine net tons, over the road, some of the track being of wood covered with strap-rail.

The financial difficulties of 1836 and 1837, which brought ruin upon so many, did not leave Mr. Baldwin unscathed. His embarrassments became so great that he was unable to proceed, and was forced to call his creditors together for a settlement. After offering to surrender all his property, his shop, tools, house, and everything, if they so desired,—all of which would realize only about twenty-five per cent. of their claims,—he proposed to them that they should permit him to go on with the business, and in three years he would pay the full amount of all claims, principal and interest. This was finally acceded to, and the promise was in effect fulfilled, although not without an extension of two years beyond the time originally proposed.

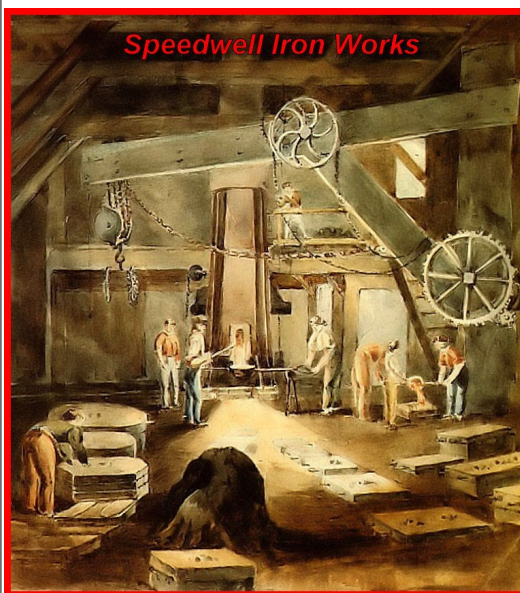
(Note) *The Panic of 1837 was a financial crisis in the United States that touched off a major depression, which lasted until the mid-1840s. Profits, prices, and wages went down, westward expansion was stalled, unemployment went up, and pessimism abounded. The panic had both domestic and foreign origins. Speculative lending practices in the West, a sharp decline in cotton prices, a collapsing land bubble, international specie flows, and restrictive lending policies in Britain were all factors. The lack of a central bank to regulate fiscal matters was also key. This ailing economy of early 1837 led investors to panic – a bank run ensued – giving the crisis its name. The run came to a head on May 10, 1837, when banks in New York City ran out of gold and silver. A significant economic collapse followed. Despite a brief recovery in 1838, the recession persisted for approximately seven years. Nearly half of all banks failed, businesses closed, prices declined, and there was mass unemployment. From 1837 to 1844 deflation in wages and prices was widespread. The lack of deposit insurance deepened the Panic. By 1850 the economy was booming again, a result of increased specie flows from the California Gold Rush.*

In May, 1837, the number of hands employed was three hundred, but this number was reducing weekly, owing to the falling off in the demand for engines. These financial troubles had their effect on the demand for locomotives, as will be seen in the decrease in the number built in 1838, 1839, and 1840; and this result was furthered by the establishment of several other locomotive works and the introduction of other patterns of engines. The changes and improvements in details made during these years may be summed up as follows:

The subject of burning coal had engaged much attention. In October, 1836, Mr. Baldwin secured a patent for a grate or fireplace which could be detached from the engine at pleasure, and a new one with a fresh coal fire substituted. The intention was to have the grate with freshly ignited coal all ready for the engine on its arrival at a station, and placed between the rails over suitable levers, by which it could be attached quickly to the fire-box. It is needless to say that this was never practiced. In January, 1838, however, Mr. Baldwin was experimenting with the consumption of coal on the Germantown road,

and in July of the same year the records show that he was making a locomotive to burn coal, part of the arrangement being to blow the fire with a fan.

Up to 1838, Mr. Baldwin had made both driving and truck wheels with wrought tires, but during that year chilled wheels for engine and tender trucks were adopted. His tires were furnished by Messrs. S. Vail & Son, Morristown, N. J., who made the only tires then obtainable in America. They were very thin, being only one inch to one and a half inches thick; and Mr. Baldwin, in importing some tires from England at that time, insisted on their being made double the ordinary thickness. The manufacturers at first objected and ridiculed the idea, the practice being to use two tires when extra thickness was wanted, but finally they consented to meet his requirements.



All his engines thus far had the single eccentric for each valve, but at about this period double eccentrics were adopted, each terminating in a straight hook, and reversed by hand-levers.

At this early period, Mr. Baldwin had begun to feel the necessity of making all like parts of locomotives of the same class in such manner as to be absolutely interchangeable. Steps were taken in this direction, but it was not until many years afterward that the system of standard gauges was perfected.

In March, 1839, Mr. Baldwin's records show that he was building a number of outside-connected engines, and had succeeded in making them strong and durable. He was also making a new chilled wheel, and one which he thought would not break.

(Note) *Chilled Cast Iron - When gray cast iron is cooled very rapidly from the melt, white cast iron, called chilled cast iron, is formed. A chilled iron casting can be produced by adjusting the carbon composition of the white cast iron, so that the normal cooling rate at the surface is just fast enough to produce white cast iron, whereas the slower cooling rate below the surface will produce gray iron. The depth of chill decreases, and the hardness of the chilled zone increases with increasing carbon content. Chromium in small amounts is often used to control chill depth. It increases hardness and improves abrasion resistance.*



CHILLED CAST IRON

A constant chill depth may be obtained by using a combination of alloying elements that have opposite effects. Since nickel reduces chill depth, it is common practice to add chromium produce the opposite effect. The normal ratio employed in this purpose is 3 parts of nickel to 1 of chromium.



Mechanical Engg. Dept., NIT Polytechnic, Nagpur (DTE Code:- 4248)

On the one hundred and thirty-sixth locomotive, completed October 18, 1839, for the Philadelphia, Germantown and Norristown Railroad, the old pattern of wooden frame was abandoned, and no outside frame whatever was employed,—the machinery, as well as the truck and the pedestals of the driving-axles, being attached directly to the naked boiler. The wooden frame thenceforward disappeared gradually, and an iron frame took its place. Another innovation was the adoption of eight-wheeled tenders, the first of which was built at about this period.

April 8, 1839, Mr. Baldwin associated with himself Messrs. Vail and Hufty, and the business was conducted under the firm name of Baldwin, Vail & Hufty until 1841, when Mr. Hufty withdrew, and Baldwin & Vail continued the co-partnership until 1842.

The time had now arrived when the increase of business on railroads demanded more powerful locomotives. It had for some years been felt that for freight traffic the engine with one pair of drivers was insufficient. Mr. Baldwin's engine had the single pair of drivers placed back of the fire-box; that made by Mr. Norris, one pair in front of the fire-box. An engine with two pairs of drivers, one pair in front and one pair behind the fire-box, was the next logical step, and Mr. Henry R. Campbell, of Philadelphia, was the first to carry this design into execution. Mr. Campbell, as has been noted, was the Chief Engineer of the Germantown Railroad when the "Ironsides" was placed on that line, and had since given much attention to the subject of locomotive construction. February 5, 1836, Mr. Campbell secured a patent for an eight-wheeled engine with four drivers connected, and a four-wheeled truck in front; and subsequently contracted with James Brooks, of Philadelphia, to build for him such a machine.

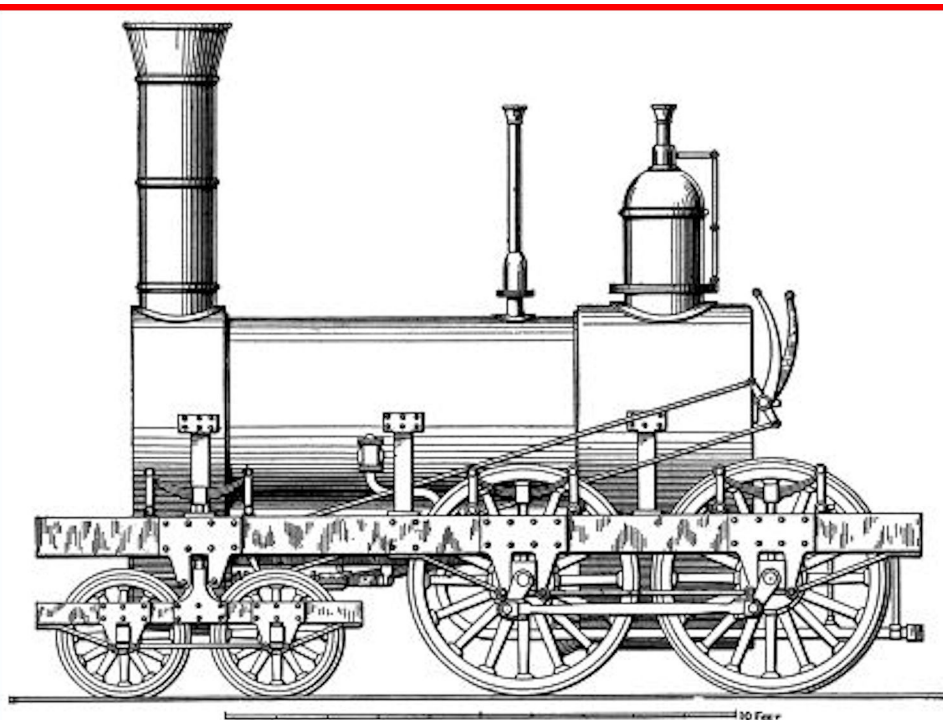


FIG. 12.—CAMPBELL'S FIRST AMERICAN EIGHT WHEEL ENGINE, 1836—
PHILADELPHIA, GERMANTOWN, AND NORRISTOWN RAILROAD.

The work was begun March 16, 1836, and the engine was completed May 8, 1837. This was the first eight-wheeled engine of this type, and from it the standard American locomotive of to-day takes its origin. The engine lacked, however, one essential feature; there were no equalizing beams between the drivers, and nothing but the ordinary steel springs over each journal of the driving-axes to equalize the weight upon them. It remained for Messrs. Eastwick & Harrison to supply this deficiency; and in 1837 that firm constructed at their shop in Philadelphia a locomotive on this plan, but with the driving-axes running in a separate square frame, connected to the main frame above it by a single central bearing on each side. This engine had cylinders twelve by eighteen, four coupled driving-wheels, forty-four inches in diameter, carrying eight of the twelve tons constituting the total weight. Subsequently, Mr. Joseph Harrison, Jr., of the same firm, substituted "equalizing beams" on engines of this plan afterward constructed by them, substantially in the same manner as since generally employed.

In the *American Railroad Journal* of July 30, 1836, a wood-cut showing Mr. Campbell's engine, together with an elaborate calculation of the effective power of an engine on this plan, by William J. Lewis, Esq., Civil Engineer, was published, with a table showing its performance upon grades ranging

from a dead level to a rise of one hundred feet per mile. Mr. Campbell stated that his experience at that time (1835-6) convinced him that grades of one hundred feet rise per mile would, if roads were judiciously located, carry railroads over any of the mountain passes in America, without the use of planes with stationary steam power, or, as a general rule, of costly tunnels,—an opinion very extensively verified by the experience of the country since that date.

A step had thus been taken toward a plan of locomotive having more adhesive power. Mr. Baldwin, however, was slow to adopt the new design. He naturally regarded innovations with distrust. He had done much to perfect the old pattern of engine, and had built over a hundred of them, which were in successful operation on various railroads. Many of the details were the subjects of his several patents, and had been greatly simplified in his practice. In fact, simplicity in all the working parts had been so largely his aim, that it was natural that he should distrust any plan involving additional machinery, and he regarded the new design as only an experiment at best. In November, 1838, he wrote to a correspondent that he did not think there was any advantage in the eight-wheeled engine. There being three points in contact, it could not turn a curve, he argued, without slipping one or the other pair of wheels sideways. Another objection was in the multiplicity of machinery and the difficulty in maintaining four driving-wheels all of exactly the same size. Some means, however, of getting more adhesion must be had, and the result of his reflections upon this subject was the project of a "geared engine."

In August, 1839, he took steps to secure a patent for such a machine, and December 31, 1840, letters patent were granted him for the device. In this engine, an independent shaft or axle was placed between the two axles of the truck, and connected by cranks and coupling-rods with cranks on the outside of the driving-wheels. This shaft had a central cog-wheel engaging on each side with intermediate cog-wheels, which in turn geared into cog-wheels on each truck-axle. The intermediate cog-wheels had wide teeth, so that the truck could pivot while the main shaft remained parallel with the driving-axle. The diameters of the cog-wheels were, of course, in such proportion to the driving and truck wheels, that the latter should revolve as much oftener than the drivers as their smaller size might require. Of the success of this machine for freight service, Mr. Baldwin was very bullish. One was put in hand at once, completed in August, 1841, and eventually sold to the Sugarloaf Coal Company. It was an outside-connected engine, weighing thirty thousand pounds, of which eleven thousand seven hundred and seventy-five pounds were on the drivers, and eighteen thousand three hundred and thirty-five on the truck. The driving-wheels were forty-four and the truck-wheels thirty-three inches in diameter. The cylinders were thirteen inches in diameter by sixteen inches stroke. On a trial of the engine upon the Philadelphia and Reading Railroad, it hauled five hundred and ninety tons from Reading to Philadelphia—a distance of fifty-four miles—in five hours and twenty-two

minutes. The Superintendent of the road, in writing of the trial, remarked that this train was unprecedented in length and weight both in America and Europe. The performance was noticed in favorable terms by the Philadelphia newspapers, and was made the subject of a report by the Committee on Science and Arts of the Franklin Institute, who strongly recommended this plan of engine for freight service. The success of the trial led Mr. Baldwin at first to believe that the geared engine would be generally adopted for freight traffic; but in this he was disappointed. No further demand was made for such machines, and no more of them were built.

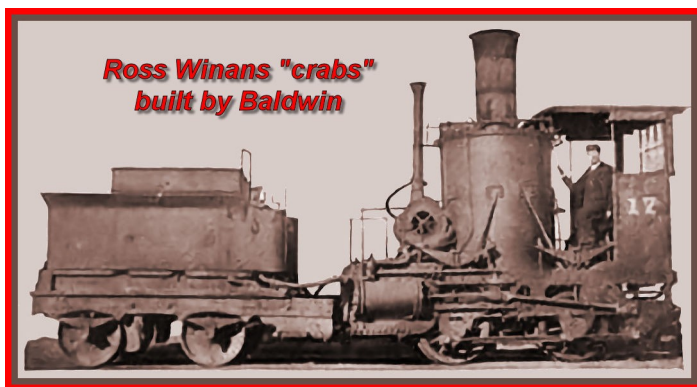
In 1840, Mr. Baldwin received an order, through August Belmont, Esq., of New York, for a locomotive for Austria, and had nearly completed one which was calculated to do the work required, when he learned that only sixty pounds pressure of steam was admissible, whereas his engine was designed to use steam at one hundred pounds and over. He accordingly constructed another, meeting this requirement, and shipped it in the following year. This engine, it may be noted, had a kind of link-motion, agreeably to the specification received, and was the first of his make upon which the link was introduced.

Mr. Baldwin's patent of December 31, 1840, already referred to as covering his geared engine, embraced several other devices, as follows:

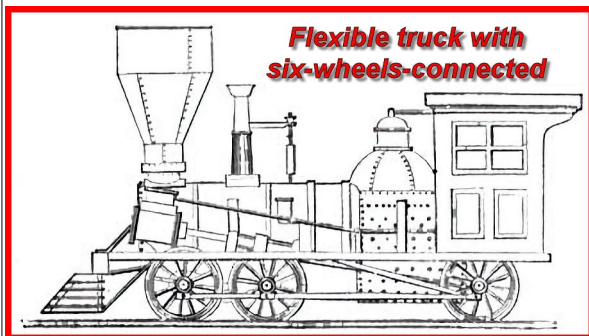
1. A method of operating a fan, or blowing-wheel, for the purpose of blowing the fire. The fan was to be placed under the footboard, and driven by the friction of a grooved pulley in contact with the flange of the driving-wheel.
2. The substitution of a metallic stuffing, consisting of wire, for the hemp, wool, or other material which had been employed in stuffing-boxes.
3. The placing of the springs of the engine truck so as to obviate the evil of the locking of the wheels when the truck-frame vibrates from the center-pin vertically. Spiral as well as semi-elliptic springs, placed at each end of the truck-frame, were specified. The spiral spring is described as received in two cups,—one above and one below. The cups were connected together at their centers by a pin upon one and a socket in the other, so that the cups could approach toward or recede from each other and still preserve their parallelism.
4. An improvement in the manner of constructing the iron frames of locomotives, by making the pedestals in one piece with, and constituting part of, the frames.
5. The employment of spiral springs in connection with cylindrical pedestals and boxes. A single spiral was at first used, but, not proving sufficiently strong, a combination or nest of spirals curving alternately in opposite directions was afterward employed. Each spiral had its bearing in a spiral recess in the pedestal.

In the specification of this patent a change in the method of making cylindrical pedestals and boxes is noted. Instead of boring and turning them in a lathe, they were cast to the required shape in chills. This method of construction was used for a time, but eventually a return was made to the original plan, as giving a more accurate job.

In 1842, Mr. Baldwin constructed, under an arrangement with Mr. Ross Winans, three locomotives for the Western Railroad of Massachusetts, on a plan which had been designed by that gentleman for freight traffic. These machines had upright boilers, and horizontal cylinders which worked cranks on a shaft bearing cog-wheels engaging with other cog-wheels on an intermediate shaft. This latter shaft had cranks coupled to four driving-wheels on each side. These engines were constructed to burn anthracite coal. Their peculiarly uncouth appearance earned for them the name of "crabs," and they were but short-lived in service.



But, to return to the progress of Mr. Baldwin's locomotive practice. The geared engine had not proved a success. It was unsatisfactory, as well to its designer as to the railroad community. The problem of utilizing more or all of the weight of the engine for adhesion remained, in Mr. Baldwin's view, yet to be solved. The plan of coupling four or six wheels had long before been adopted in England, but on the short curves prevalent on American railroads, he felt that something more was necessary. The wheels must not only be coupled, but at the same time must be free to adapt themselves to a curve. These two conditions were apparently incompatible, and to reconcile these inconsistencies was the task which Mr. Baldwin set himself to accomplish. He undertook it, too, at a time when his business had fallen off greatly and he was involved in the most serious financial embarrassments. The problem was constantly before him, and at length, during a sleepless night, its solution flashed across his mind. The plan so long sought for, and which, subsequently, more than any other of his improvements or inventions, contributed to the foundation of his fortune, was his well-known six-wheels-connected locomotive with the four front drivers combined in a flexible truck.



For this machine Mr. Baldwin secured a patent, August 25, 1842. Its principal characteristic features are now matters of history, but they deserve here a brief mention. The engine was on six wheels, all connected as drivers. The rear wheels were placed rigidly in the frames, usually behind the fire-box, with inside bearings. The cylin-

ders were inclined, and with outside connections. The four remaining wheels had inside journals running in boxes held by two wide and deep wrought-iron beams, one on each side. These beams were unconnected, and entirely independent of each other. The pedestals formed in them were bored out cylindrically, and into them cylindrical boxes, as patented by him in 1835, were fitted.

The first engine of the new plan was finished early in December, 1842, being one of fourteen engines constructed in that year, and was sent to the Georgia Railroad, on the order of Mr. J. Edgar Thomson, then Chief Engineer and Superintendent of that line. It weighed twelve tons, and drew, besides its own weight, two hundred and fifty tons up a grade of thirty-six feet to the mile.

Other orders soon followed. The new machine was received generally with great favor. The loads hauled by it exceeded anything so far known in American railroad practice, and discerning managers hailed it as a means of largely reducing operating expenses. On the Central Railroad of Georgia, one of these twelve-ton engines drew nineteen eight-wheeled cars, with seven hundred and fifty bales of cotton, each bale weighing four hundred and fifty pounds, over maximum grades of thirty feet per mile, and the manager of the road declared that it could readily take one thousand bales.

But the flexible-beam truck also enabled Mr. Baldwin to meet the demand for an engine with four drivers connected. Other builders were making engines with four drivers and a four-wheeled truck, of the present American standard type. To compete with this design, Mr. Baldwin modified his six-wheels-connected engine by connecting only two out of the three pairs of wheels as drivers, making the forward wheels of smaller diameter as leading wheels, but combining them with the front drivers in a flexible-beam truck.

This machine of course came in competition with the eight-wheeled engine having four drivers, and Mr. Baldwin claimed for his plan a decided superiority. In each case about two-thirds of the total weight was carried on the four drivers, and Mr. Baldwin maintained that his engine, having only six instead of eight wheels, was simpler and more effective.

With the introduction of the new machine, business began at once to revive, and the tide of prosperity turned once more in Mr. Baldwin's favor. Twelve engines were constructed in 1843, all but four of them of the new pattern; twenty-two engines in 1844, all of the new pattern; and twenty-seven in 1845. Three of this number were of the old type, with one pair of drivers, but from that time forward the old pattern with the single pair of drivers disappeared from the practice of the establishment, save occasionally for exceptional purposes.

In 1842, the partnership with Mr. Vail was dissolved, and Mr. Asa Whitney, who had been Superintendent of the Mohawk and Hudson Railroad, became a partner with Mr. Baldwin, and the firm continued as Baldwin & Whitney until 1846, when the latter withdrew to engage in the manufacture of car-wheels, in which business he is still concerned as senior member of the firm of A. Whitney & Sons, Philadelphia.

Mr. Whitney brought to the firm a railroad experience and thorough business talent. He introduced a system in many details of the management of the business, which Mr. Baldwin, whose mind was devoted more exclusively to mechanical subjects, had failed to establish or wholly ignored. The method at present in use in the establishment, of giving to each class of locomotives a distinctive designation, composed of a number and a letter, originated very shortly after Mr. Whitney's connection with the business. For the purpose of representing the different designs, sheets with engravings of locomotives were employed. The sheet showing the engine with one pair of drivers was marked B; that with two pairs, C; that with three, D; and that with four, E. Shortly afterwards, a number, indicating the weight in gross tons, was added. Thus, the 12 D engine was one with three pairs of drivers, and weighing twelve tons; the 12 C, an engine of same weight, but with only four wheels connected. Substantially this system of designating the several sizes and plans has been retained to the present time. The figures, however, are no longer used to express the weight, but merely to designate the class.

The adoption of the plan of six-wheels-connected engines opened the way at once to increasing their size. Hence, engines of eighteen and twenty tons weight were shortly introduced, and in 1844 three of twenty tons weight, with cylinders sixteen and one-half inches diameter by eighteen inches stroke, were constructed for the Western Railroad of Massachusetts, and six, of eighteen tons weight, with cylinders fifteen by eighteen, and drivers forty-six inches in diameter, were built for the Philadelphia and Reading Railroad.

The period under consideration was marked also by the introduction of the French & Baird stack, which proved at once to be one of the most successful spark-arresters thus far employed, and which was for years used almost exclusively wherever, as on the cotton-carrying railroads of the South, a thoroughly effective spark-arrester was required.

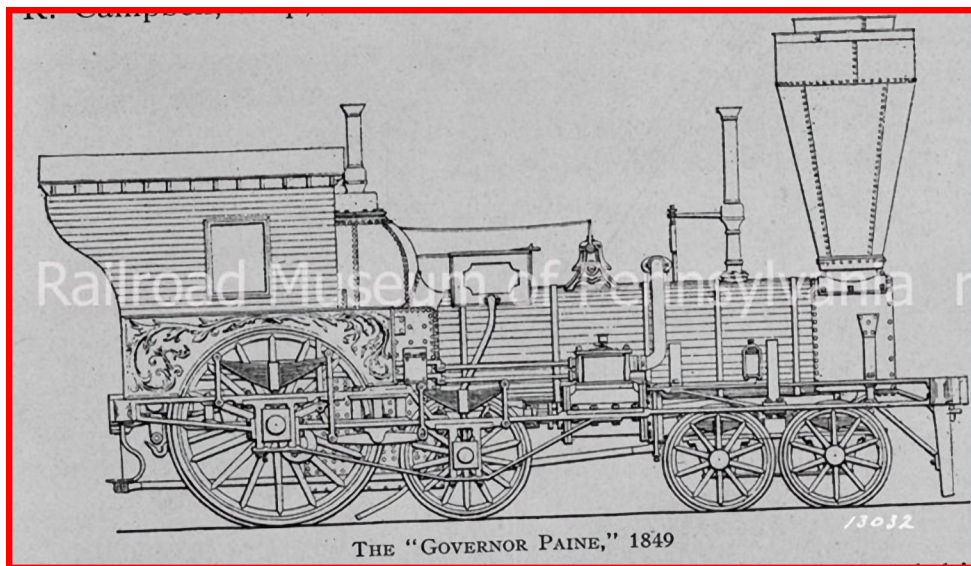
The cone over the straight inside pipe was made with volute flanges on its under side, which gave a rotary motion to the sparks. Around the cone was a casing about six inches smaller in diameter than the outside stack. Apertures were cut in the sides of this casing, through which the sparks in their rotary motion were discharged and thus fell to the bottom of the space between the straight inside pipe and the outside stack. The opening in the top of the stack was fitted with a series of V-shaped iron circles perforated with numerous holes, thus presenting an enlarged area, through which the smoke escaped.

Meanwhile the flexible truck machine maintained its popularity for heavy freight service. All the engines thus far built on this plan had been six-wheeled, some with the rear driving-axle back of the fire-box, and others with it in front. The next step, following logically after the adoption of the eight-wheeled "C" engine, was to increase the size of the freight machine, and distribute the weight on eight wheels all connected. This was first done in 1846, when seventeen engines on this plan were constructed on one order for the Philadelphia and Reading Railroad Company. These engines were the first ones on which Mr. Baldwin placed sand-boxes, and they were also the first built by him with roofs. On these engines for the Reading Railroad, four iron posts were carried up, and a wooden roof supported by them. The engine-men added curtains at the sides and front, and Mr. Baldwin on subsequent engines added sides, with sash and glass. The cab proper, however, was of New England origin, where the severity of the climate demanded it, and where it had been used previous to this period.

Forty-two engines were completed in 1846, and thirty-nine in 1847. The use of iron tubes in freight engines grew in favor, and in October, 1847, Mr. Baldwin noted that he was fitting his flues with copper ends, "for riveting to the boiler." The subject of burning coal continued to engage much attention, but the use of anthracite had not as yet been generally successful. In October, 1847, the Baltimore and Ohio Railroad Company advertised for proposals for four engines to burn Cumberland coal, and the order was taken and filled by Mr. Baldwin with four of his eight-wheels-connected machines.

The year 1848 showed a falling off in business, and only twenty engines were turned out. In the following year, however, there was a rapid recovery, and the production of the works increased to thirty, followed by thirty-seven in 1850, and fifty in 1851. These engines, with a few exceptions, were confined to three patterns, the eight-wheeled four-coupled engine, from twelve to nineteen tons in weight, for passengers and freight, and the six- and eight-wheels-connected engine, for freight exclusively, the six-wheeled machine weighing from twelve to seventeen tons, and the eight-wheeled, from eighteen to twenty-seven tons. The drivers of these six- and eight-wheels-connected machines were made generally forty-two, with occasional variations up to forty-eight, inches in diameter.

Early in 1848, the Vermont Central Railroad was approaching completion, and Governor Paine, the President of the Company, conceived the idea that the passenger service on the road required locomotives capable of running at very high velocities, sixty miles per hour. Mr. Baldwin at once undertook to meet these conditions. The engine was completed in 1849, and was named the "Governor Paine."



(Note) *The "Governor Paine" was used for several years on the Vermont Central Railroad, and then rebuilt into a four-coupled machine. During its career, it was stated by the officers of the road that it could be started from a state of rest and run a mile in forty-three seconds.*

The business in 1851 had reached the full capacity of the shop. Contracts for work extended a year ahead, and, to meet the demand, the facilities in the various departments were increased, and resulted in the construction of sixty engines in 1853, and sixty-two in 1854. Mr. Matthew Baird, who had been connected with the works since 1836 as one of its foremen, entered into partnership with Mr. Baldwin and the company became M. W. Baldwin & Co.

In February, 1852, Mr. J. Edgar Thomson, President of the Pennsylvania Railroad Company, invited proposals for a number of freight locomotives of fifty-six thousand pounds weight each. Mr. Baldwin secured the contract, and built twelve engines of the prescribed dimensions. The ten wheeled engine thereafter assumed a place in the Baldwin classification. In 1858 and '59, one was constructed for the South Carolina Railroad, and some were sent out to railroads in Cuba.

In 1853, Mr. Charles Ellet, Chief Engineer of the Virginia Central Railroad, laid a temporary track across the Blue Ridge, at Rock Fish Gap, for use during the construction of a tunnel through the mountain. This track was twelve thousand five hundred feet in length on the eastern slope, ascending in that distance six hundred and ten feet. This track was worked by two of the Baldwin six-wheels-connected flexible-beam truck locomotives constructed in 1853-54.



The regular daily service of each of the engines was to make four trips, of eight miles, over the mountain, drawing one eight-wheel baggage car, together with two eight-wheel passenger cars, in each direction. The Mountain Top Track was worked successfully for several years, until it was abandoned on the completion of the tunnel.

The production of the establishment during the six years from 1855 to 1860, inclusive, was as follows: forty-seven engines in 1855; fifty-nine in 1856; sixty-six in 1857; thirty-three in 1858; seventy in 1859; and eighty-three in 1860.

The year 1861 witnessed a marked falling off in the production. The breaking out of the war at first unsettled business, and by many it was thought that railroad traffic would be so largely reduced that the demand for locomotives must cease altogether. A large number of hands were discharged from the works, and only forty locomotives were turned out during the year. It was even seriously contemplated to turn the resources of the establishment to the manufacture of shot and shell, and other munitions of war, the belief being entertained that the building of locomotives would have to be altogether suspended.

So far, however, was this from being the case, that, after the first excitement had subsided, it was found that the demand for transportation by the general government, and by the branches of trade and production created by the war, was likely to tax the carrying capacity of the principal Northern railroads to the fullest extent. The government itself became a large purchaser of locomotives, and it is noticeable, as indicating the increase of travel and freight transportation, that heavier machines than had ever before been built became the rule. Seventy-five engines were sent from the works in 1862; ninety-six in 1863; one hundred and thirty in 1864; and one hundred and fifteen in 1865.

The introduction of steel in locomotive-construction was a distinguishing feature of the period. Steel tires were first used in the works in 1863, on some engines for the Don Pedro II. Railway of South America. Their general adoption on American railroads followed slowly. No tires of this material were then made in this country, and it was objected to their use that, as it took from sixty to ninety days to import them, an engine, in case of a breakage of one of its tires, might be laid up useless for several months. To obviate this objection, M. W. Baldwin & Co. imported five hundred steel tires, most of which were kept in stock, from which to fill orders.

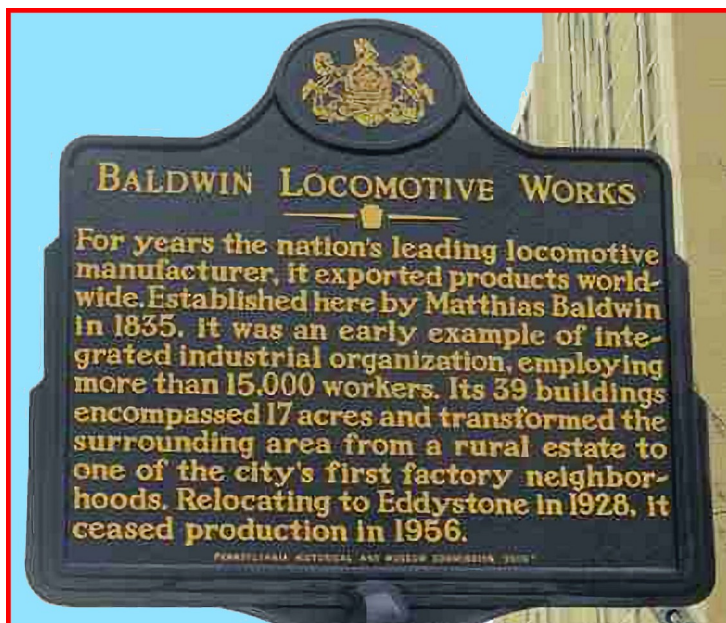
When Mr. Baldwin died, September 7, 1866. He had been permitted, in a life of unusual activity and energy, to witness the rise and wonderful increase of a material interest which had become the distinguishing feature of the century. He had done much, by his own mechanical skill and inventive genius, to contribute to the development of that interest. His name was as "familiar as household words" wherever on the American continent the locomotive had penetrated. An ordinary ambition might well have been satisfied with this achievement. But Mr. Baldwin's claim to the remembrance of his fellow-men rests not alone on the results of his mechanical labors. A merely technical history, such as this, is not the place to do justice to his memory as a man, and as a philanthropist; yet the record would be manifestly imperfect, and would fail properly to reflect the sentiments of his business associates who so long knew him in all relations of life, were no reference made to his many virtues and noble traits of character.

Mr. Baldwin was a man of sterling integrity and singular conscientiousness. To do right, absolutely and unreservedly, in all his relations with men, was an instinctive rule of his nature. His heroic struggle to meet every dollar of his liabilities, principal and interest, after his failure, consequent upon the general financial crash in 1837, constitutes a chapter of personal self-denial and determined effort which is seldom paralleled in the annals of commercial experience. When most men would have felt that an equitable compromise with creditors was all that could be demanded in view of the general financial embarrassment, Mr. Baldwin insisted upon paying all claims in full, and succeeded in doing so only after nearly five years of unremitting industry, close economy, and absolute personal sacrifices.

As a philanthropist and a sincere and earnest man, zealous in every good work, his memory is cherished by many to whom his contributions to locomotive improvement are comparatively unknown. From the earliest years of his business life the practice of systematic benevolence was made a duty and a pleasure. His liberality constantly increased with his means. Indeed, he would unhesitatingly give his notes, in large sums, for charitable purposes, when money was absolutely wanted to carry on his business. Apart from the thousands which he expended in private charities, and of which, of course, little can be known, Philadelphia contains many monuments of his munificence. In his mental character, Mr. Baldwin was a man of remarkable firmness of purpose. This trait was strongly shown during his mechanical career, in the persistency with which he would work at a new improvement or resist an innovation.

If he was led sometimes to assume an attitude of antagonism to features of locomotive-construction which after-experience showed to be valuable,—and a desire for historical accuracy has required the mention, in previous pages, of several instances of this kind,—it is at least certain that his opposition was based upon a conscientious belief in the mechanical impolicy of the proposed changes. After the death of Mr. Baldwin, the business was reorganized, in 1867, under the title of "The Baldwin Locomotive Works," M. Baird & Co., Proprietors. Messrs. George Burnham and Charles T. Parry, who had been connected with the establishment from an early period, the former in charge of the finances, and the latter as General Superintendent, were associated with Mr. Baird in the co-partnership. Three years later, Messrs. Edward H.

Williams, William P. Henszey, and Edward Longstreth became members of the firm. Mr. Williams had been connected with railway management on various lines since 1850. Mr. Henszey had been Mechanical Engineer, and Mr. Longstreth the General Superintendent of the Works for several years previously.





Baldwin was for decades the world's largest producer of steam locomotives. Baldwin produced the last of its 70,000-plus locomotives in 1951, before merging with the Lima-Hamilton Corporation on September 11, 1951, to form the Baldwin-Lima-Hamilton Corporation. Baldwin, as King of Steam Locomotives, manufactured and shipped their iron horses around the world.

***This Baldwin 2-8-0 Consolidation-type
was built for the Oneida & Western Railroad in 1916
and was operated from 1937 to 1953 on the
Rahway Valley Railroad's New Jersey short line.
Preserved at Steamtown National Historic Site.***



California Western Railroad #45



**SNCF Class 141R n° 1199,
built by Baldwin in 1947,
now preserved in Nantes, France**



**Soviet locomotive Ea-2201
built by Baldwin in 1944**



About the Author

Larry W Jones is a songwriter, having penned over 7,700 song lyrics. Published in 22 volumes of island themed, country, cowboy, western and bluegrass songs. The entire assemblage is the world's largest collection of lyrics written by an individual songwriter.

As a wrangler on the “Great American Horse Drive”, at age 68, he assisted in driving 800 half-wild horses 62 miles in two days, from Winter pasture grounds in far NW Colorado to the Big Gulch Ranch outside of Craig Colorado.

His book, “The Oldest Greenhorn”, chronicles the adventures and perils in earning the “Gate-to-Gate” trophy belt buckle the hard way.



Other books published by Larry W Jones:

1. A Squirrel Named Julie and The Fox Ridge Fox
2. The Painting Of A Dream
3. The Boy With Green Thumbs and The Wild Tree Man
4. Red Cloud – Chief Of the Sioux
5. Spotted Tail – The Orphan Negotiator
6. Little Crow – The Fur Trapper's Patron
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